Air Force SBIR STTR INNOVATION
TECHNOLOGY WITH DEMONSTRATED RELEVANCE
UNLEASHES THE ABILITY TO DETECT SMALLER, FASTER TARGETS

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AF131-098

TOPIC TITLE:
Night Glow Short Wave Infrared LED Image Projector Development (NSLEDS)

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FA8651-14-C0174

SBIR COMPANY NAME:
Chip Design Systems LLC
Hockessin, DE

TECHNICAL PROJECT OFFICE:
AFRL
Munitions Directorate
Eglin AFB, FL

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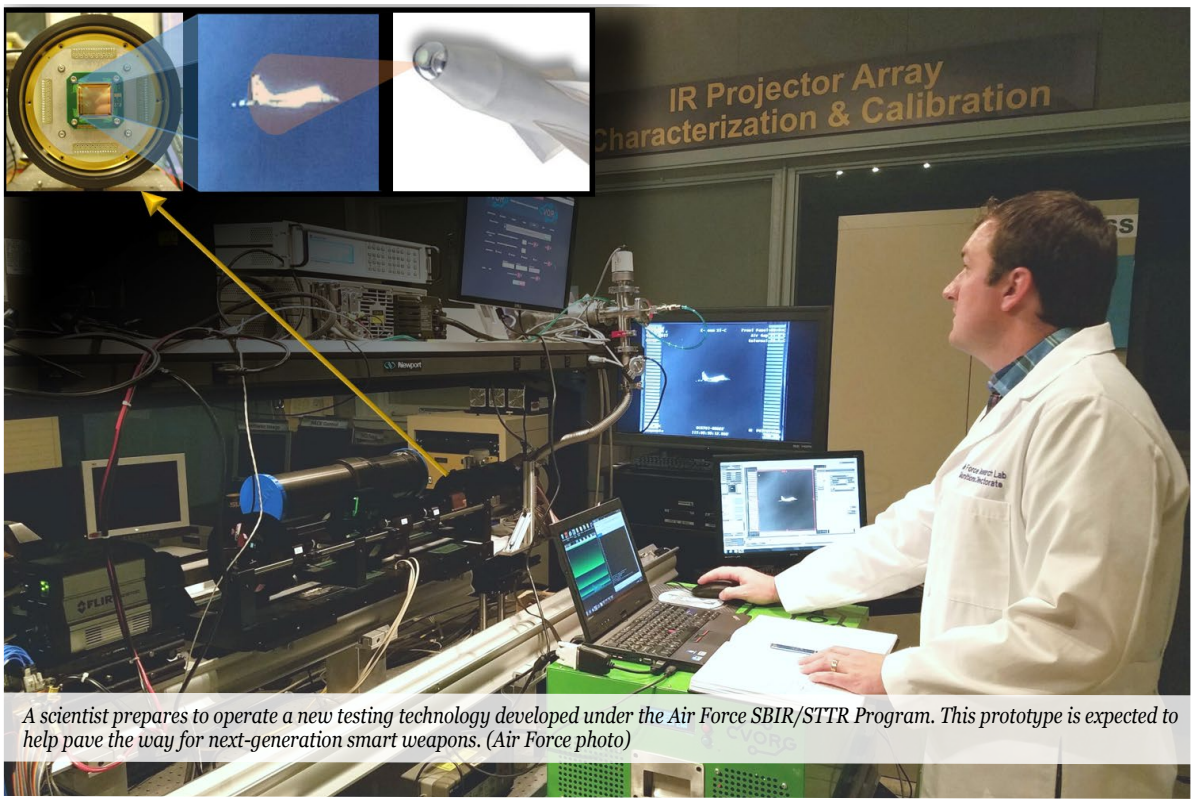

A scientist prepares to operate a new testing technology developed under the Air Force SBIR/STTR Program. This prototype is expected to help pave the way for next-generation smart weapons. (Air Force photo)

NEW TESTING TECHNOLOGY

REMOVES BARRIER TO EXPLOITING IMPROVED SMART WEAPON CAPABILITIES

The next generation of smart weapons is a step closer to the warfighters' arsenal because of a partnership between a Delaware-based small business and the Air Force Research Laboratory.

With support from the Air Force Small Business Innovation Research/Small Business Technology Transfer Program, Chip Design Systems LLC and its team of experts worked with AFRL's Munitions Directorate to bridge the gap between newer smart weapon sensors and the ability to fully exploit those improved capabilities.

Smart weapons with Infrared imaging sensors are known for their accuracy and can provide big tactical advantages, but the path to their deployment requires extensive validation testing on the ground.

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BEHIND THE TECHNOLOGY

Smart weapons use infrared imaging seekers to detect and hit targets. While large amounts of money are spent developing this class of sensors, the industry has devoted much less funding toward test technologies.

In recent years, the infrared scene projectors used for testing infrared imaging seekers have seen only modest improvements in brightness, spatial resolution and frame rate. Meanwhile, those sensors have improved at a much faster rate, so the ability to test them has been severely limited.

The Night Glow Short Wave Infrared LED Image Projector Development – also known as NSLEDS – was intended to demonstrate an infrared scene projector that used the newest micro-infrared light-emitting diode array technology. This concept is similar to the visible LEDs in today's light bulbs, but producing infrared light images on a high-resolution, micron-size scale.

By offering at least twice the frame rate and higher brightness, with the same image resolution of current micro-resistor based arrays, NSLEDS allows infrared scene projectors to keep up with newer imaging performance. As a result, the Air Force now has a means to test next-generation smart weapons that are able to detect smaller, faster moving targets in increasingly complex backgrounds.

Officials from Chip Design Systems say the Air Force SBIR/STTR Program was critical to building and integrating the system. Among the critical components funded were micro-infrared LED arrays that generate the infrared light; read-in-integrated circuits that allow the addressing and intensity modulation of each pixel; and the electronics and packaging necessary to demonstrate performance capability.

A TEAM EFFORT FUELED PROGRESS

Chip Design Systems handled the tasks of read-in-integrated circuit design, package design and thermal modeling, while leading a team of experts including:

- The University of Iowa and Firefly Photonics - micro-infrared LED fabrication;
- ON Semiconductor - CMOS chip fabrication;
- Teledyne Scientific - hybridization; and
- The University of Delaware - system and CSE design.

In early 2017, the NSLEDS project delivered a first prototype to Eglin Air Force Base for further technical evaluation and has already logged several hundred hours of operation.

This prototype paved the way for Chip Design Systems to receive a contract to create an even higher resolution device for smart weapon testing by the Air Force. By applying lessons learned and technology developed under NSLEDS, the company is now in the process of building an infrared LED scene projector with four times the resolution at a significantly reduced risk.

BACKGROUND IN ACADEMIC RESEARCH

The innovation brought to life during NSLEDS is a solid example of academic research being transitioned to a small business to meet Department of Defense needs.

The roots of Chip Design Systems can be traced to research started more than a decade ago at the University of Delaware. There is still a close relationship between the two and a key to this latest advancement was intellectual property licensed to Chip Design Systems by the university.